

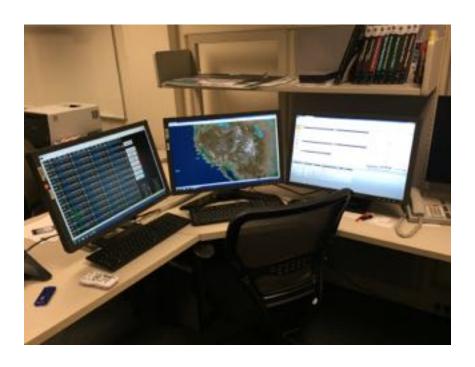
#### **Airline Operations Research Group**



- The purpose of the NASA Ames Airline Operations Research Group (AORG) is to perform airline operations research
  - Increase NASA's support of the airlines
- Laboratory created in 2015 in the Human Systems Integration Division
- AORG Projects:
  - Airline Operations Workshop
  - Ramp Incident Data Analysis
  - Turbulence Detection
  - Dispatcher Human Factors Study
  - Airline Operations Forum

### **Airline Operations Research Group**







#### **NASA/Industry Collaboration**



- Held an Airline Operations Workshop at NASA Ames in August 2016
  - About 200 attendees
  - Focused on NASA, FAA, and private sector innovations to support the airlines (AOC and flight deck)
  - Identified gaps where research is needed
  - Formed partnerships with airline industry

#### Research themes

- AOC simulation
- Study dispatcher workload, situation awareness, errors
- Display/system integration
- Managing/accessing large information databases from multiple sources
- Preferred routes

#### **Airline Operations Research Forum**



- The need for a collaborative online environment was suggested as a follow up to the Airline Operations Forum
- The AORG is creating the Airline Operations Forum to support discussion of industry problems
- NASA researchers will participate to review posts and suggest solutions
- The forum is membership access only (not open to the general public)
- It is moderated by NASA personnel and securely hosted on NASA servers
- The forum goes live on November 3, 2017

#### **Airline Operations Research Forum**





#### Welcome

Welcome to the Airline Operations Forum. This forum, sponsored by the National Aeronautics and Space Administration's (NASA) Ames Research Center, is for the airline industry, Federal Aviation Administration, NASA, airline industry organizations, and aeronautics research groups to identify and discuss airline operational issues. The goal of the forum is to raise airline industry issues that need attention with an aim to identifying possible corporate or government resources to address them. However, there is no assurance that by starting a topic on the forum, efforts will be made to solve it. This depends upon the availability of private or government funds and personnel.

Access to the forum is on a member-only basis. The contents of the forum are not available to the general public. Forum posts will be screened prior to publishing. We want participants to feel comfortable with raising and talking about possibly sensitive issues with each other. Please keep the discussions positive, respectful, and politic. Mention of political opinions and issues should be avoided.

The identities of participants will be held in confidence. Of course, you can identify yourself in your posts, if you want. The text of the ongoing discussions will also be kept in confidence on the NASA server. When NASA identifies an issue for further follow up, the problem statement used for project planning will be shared and reviewed with the forum members prior to using it in an internal NASA document. Any specific or identifying information will be cleared with the specific participants prior to use by NASA.

We are starting the forum with a few basic topics. Members are invited to suggest new topics at any time to help organize the forum.

Please tell your co-workers and colleagues about the forum. We hope to build industry-wide participation for the forum as another place that you can discuss what is important to your operations, work, or research.

Please contact me if you have any questions.

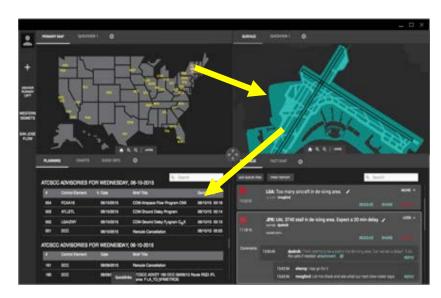
Richard Mogford, Ph.D. richard.mogford@nasa.gov NASA Ames Research Center



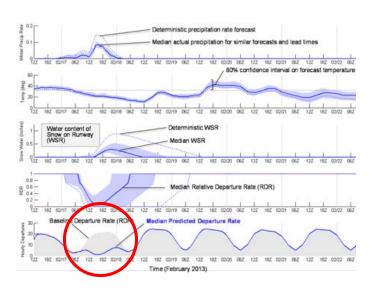
#### Flight Awareness Collaboration Tool



- Developing the "Flight Awareness Collaboration Tool" (FACT)
- Concentrates information about winter weather events on one display
- Includes predictive tools
- Supports collaboration between airline operations center, air traffic control, airport authority, and de-icing operators



**FACT Screen** 



Winter Weather Airport Capacity Model

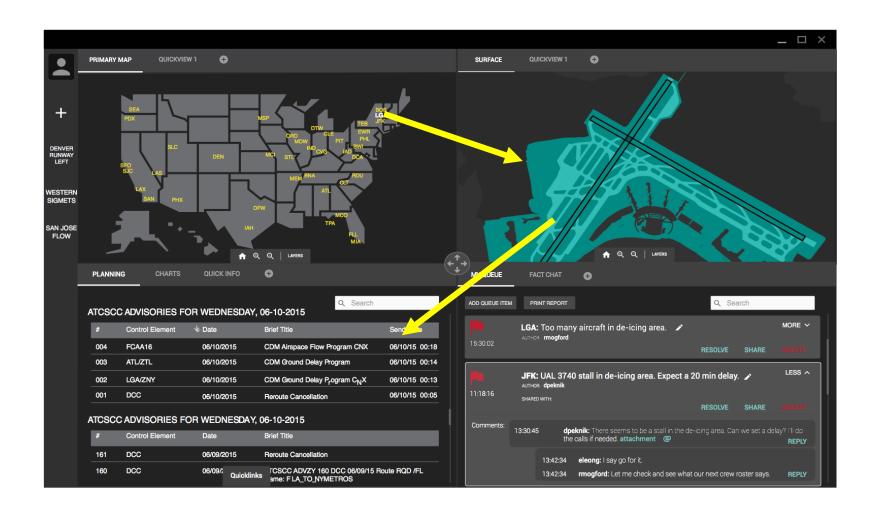
### **FACT User Interface Design**



|                 | Quick View Tabs   | Quick View Tabs  |
|-----------------|---|--|
|                 | <b>Primary Map View</b><br>displays current US map                                      | Surface Map View<br>displays current airport<br>surface map            |
| Profiles<br>Bar | ZOOM/PAN CONTROLS/COLLAPSIBLE MENU  | ZOOM/PAN CONTROLS/COLLAPSIBLE MENU                                     |
|                 | Quick View Tabs   | Quick View Tabs  |
|                 | Information View formatted data for current airport  ZOOM/PAN CONTROLS/COLLAPSIBLE MENU | Communication View  communication with other groups and issue tracking |

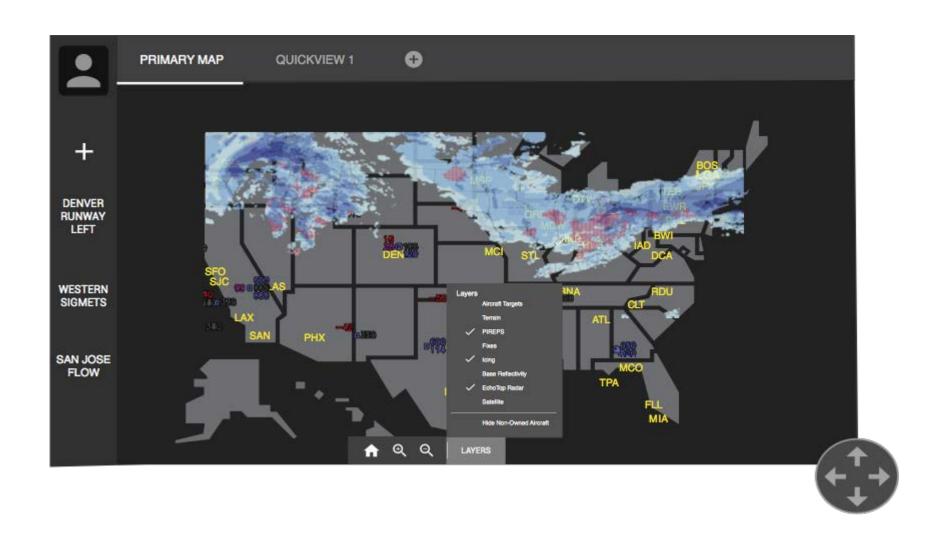
#### **FACT User Interface Design**





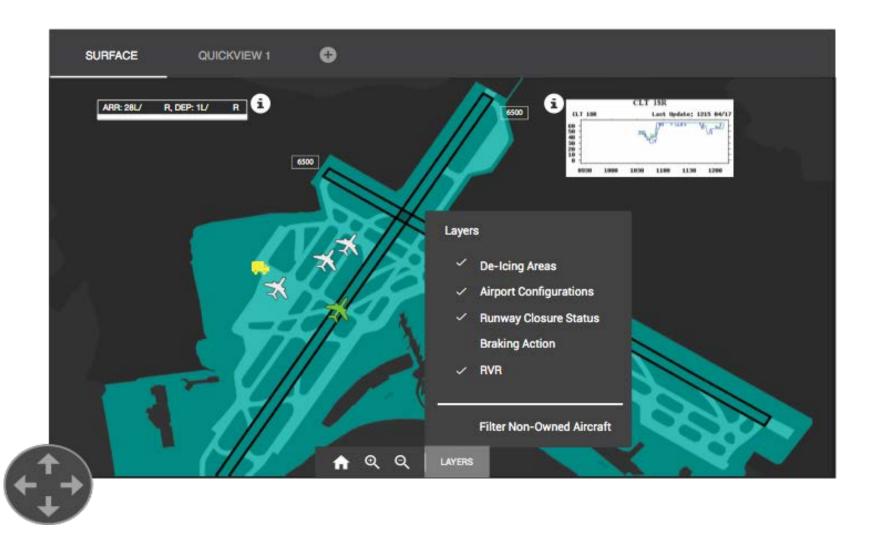
### **FACT Primary Map View**





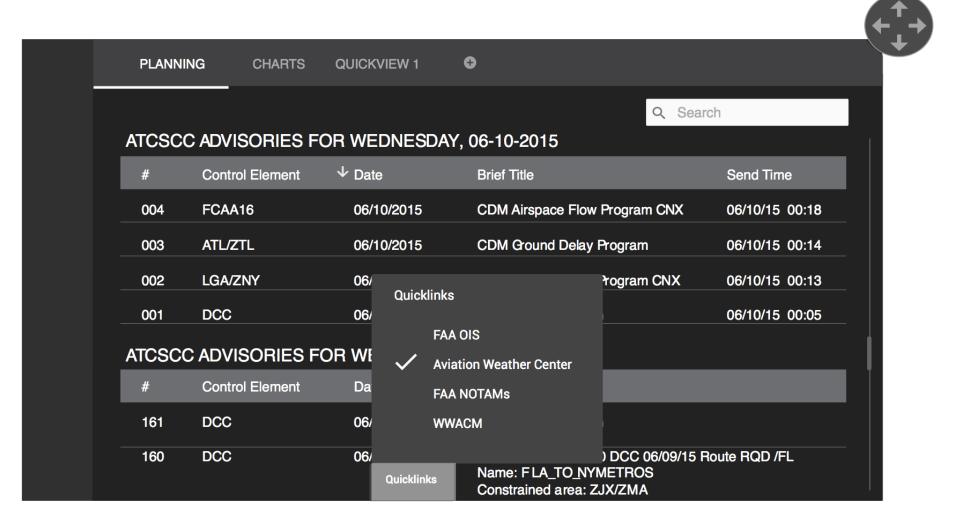
### **FACT Surface Map View**





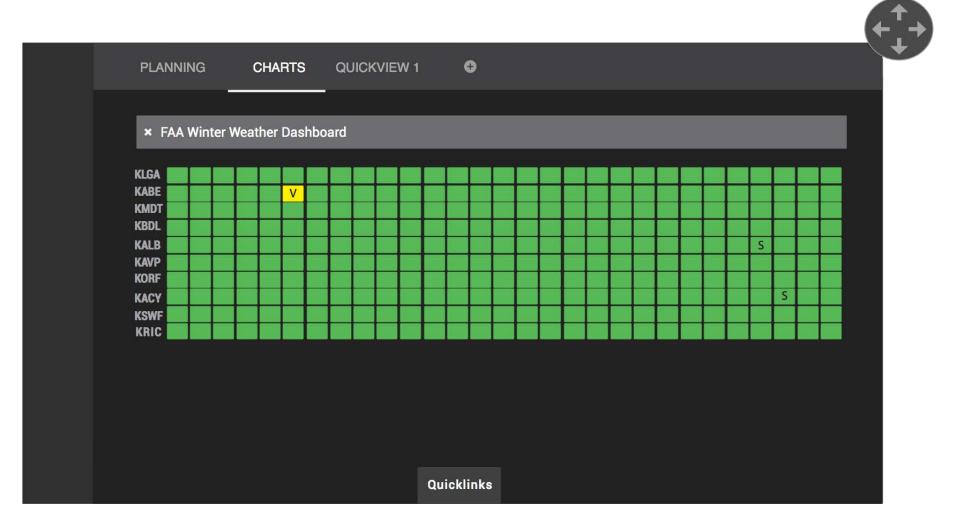
#### **FACT Information View**





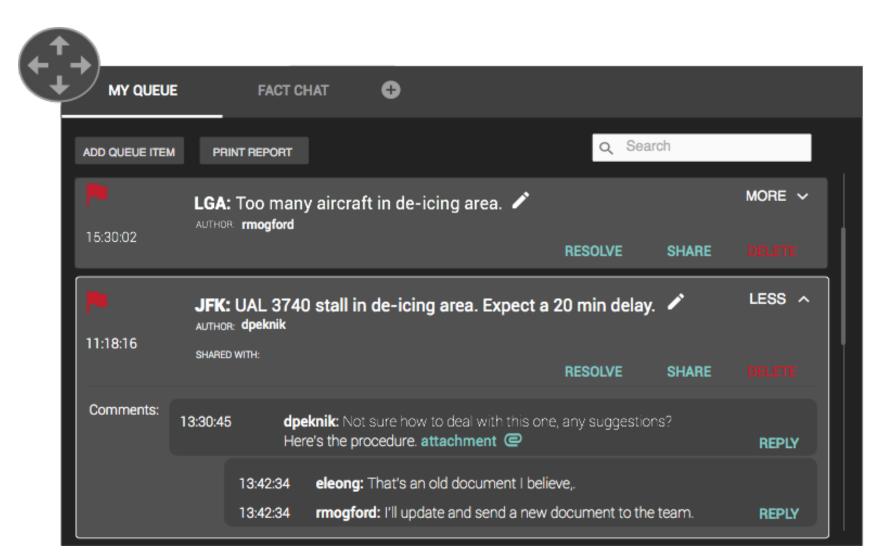
## **FACT Information View (Graphical)**





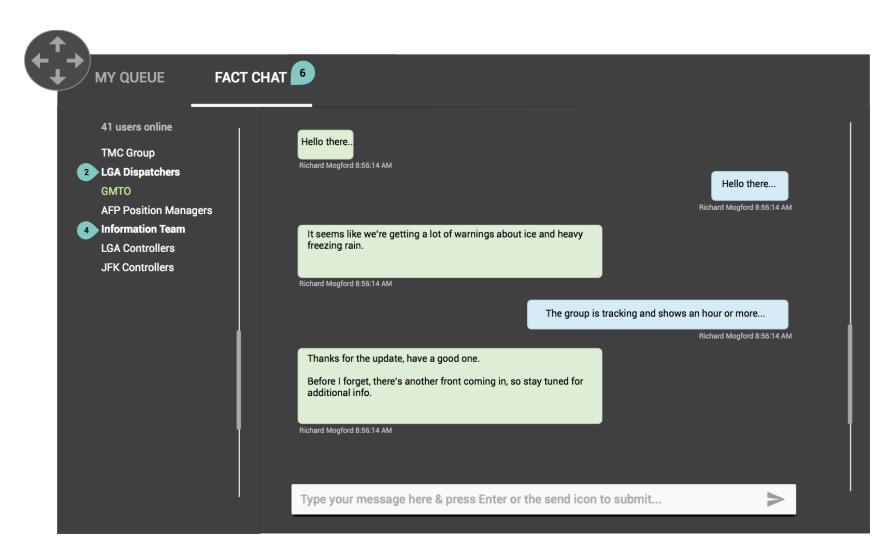
#### **FACT Communication View (MyQueue)**





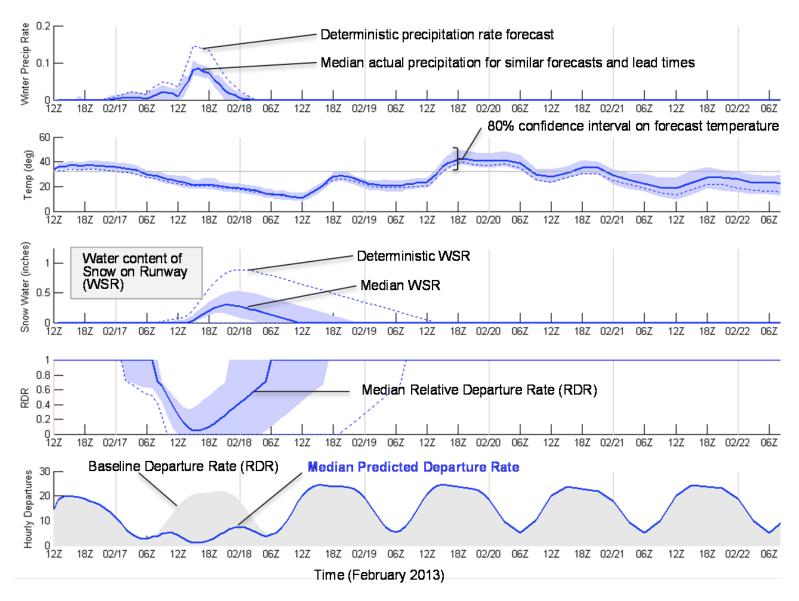
### **FACT Communication View (Chat)**





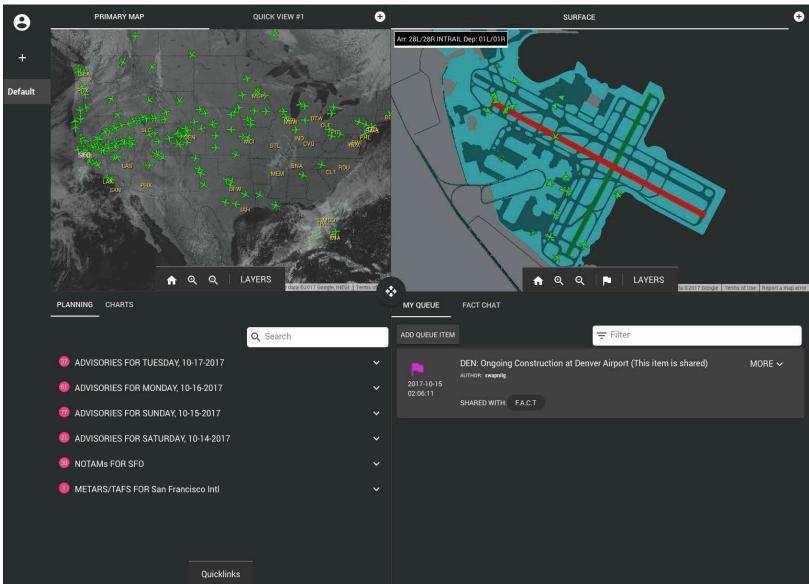
#### Winter Weather Airport Capacity Model





#### **FACT Prototype**





#### **FACT Status**



- User interface designed and web-based prototype development completed
- Showing FACT to airlines to request feedback on functionality and user interface design
- Developing a cooperative work agreement with United Airlines for use of FACT
- FACT is available to be integrated into existing tools

#### **Inadvertent Door Slide Activation**



- The AORG investigated inadvertent door slide activations
- May occur if cabin crew does not disarm doors upon arrival
- If the slide partially deploys, the resulting disruption can be costly due to maintenance and schedule delays
- Initial design of a door handle cover "reminder" solution has been drafted for consideration

#### **Door Slide Mechanism (Boeing 737)**

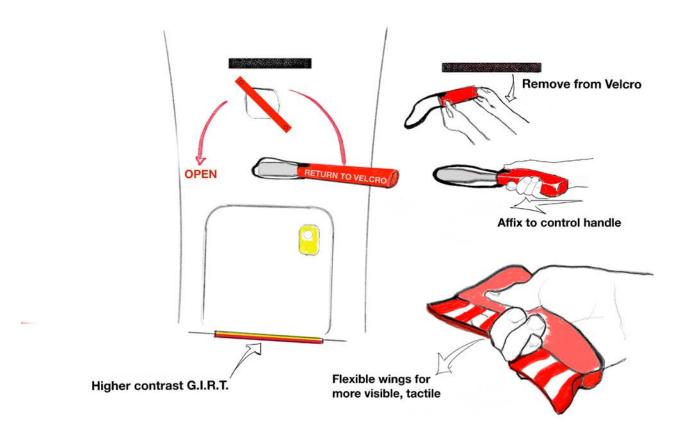




Door slide is armed by hooking a bar (1) under clips (2) on cabin floor. Red strap (3) is fastened over the window to alert jet bridge personnel that the door is armed. Bar is removed from clips to disarm.

#### **Door Slide Sleeve**





Add a red fabric sleeve that slips over the door handle when crew member arms the door slide. Crew member will feel the cover when they start to open the door if the slide is still armed.

#### **Human Factors Study**



- Completed a human factors evaluation of dispatch operations at three major airlines
  - Documented dispatcher tasks and work environment
  - Discussed current methods of assessing dispatcher workload
  - Reviewed typical situation and planning displays
  - One of the first studies of its kind



#### **Turbulence Detection Study**



- Initiated a study at the University Corporation for Atmospheric Research (UCAR) on turbulence
  - Clear air turbulence is a major problem and causes injuries and damage
  - NASA Langley has a prototype ground-based system for locating turbulence out to 300 km using acoustic arrays
  - Initiated a study with UCAR to evaluate the feasibility of an acoustic system
  - Early indications support
     Langley approach
  - Report due mid-2018



Infrasonic array installed at NASA Langley

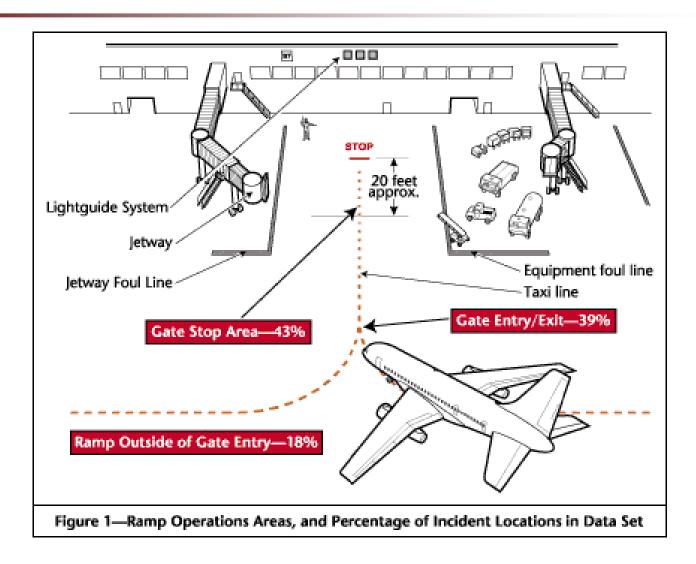
#### Ramp Incident Research



- Worldwide, ramp incidents cause damage to vehicles and aircraft and cost airlines about \$10 billion each year
- Ramp is a very busy area with multiple vehicles and personnel operating on under time pressure
- NASA analyzed several years of ramp incident data for a major airline
- Most frequent events:
  - 1. Tow bar shear pin breakage
  - 2. Damage to aircraft by provisioning trucks
  - 3. Damage to aircraft by belt loader positioning
- Highest out of service costs resulted from:
  - 1. Towing/pushback
  - 2. Vehicle movement
  - 3. Cargo operations
- The AORG will be continuing the analysis of ramp activities

#### **Ramp Incident Data**





Accident Percentages in Aircraft Clearance Zones

(from Aviation Reporting Safety System data)



# **Questions?**

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